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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,296	02/06/2004	Ramesh B. Poola	GP-304476	5419

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EXAMINER
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MCMAHON, MARGUERITE J

ART UNIT	PAPER NUMBER
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3747

DATE MAILED: 02/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

6

<b>Office Action Summary</b>	<b>Application No.</b> 10/774,296	<b>Applicant(s)</b> POOLA ET AL.	
	<b>Examiner</b> Marguerite J. McMahon	<b>Art Unit</b> 3747	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 and 13-20 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 13-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

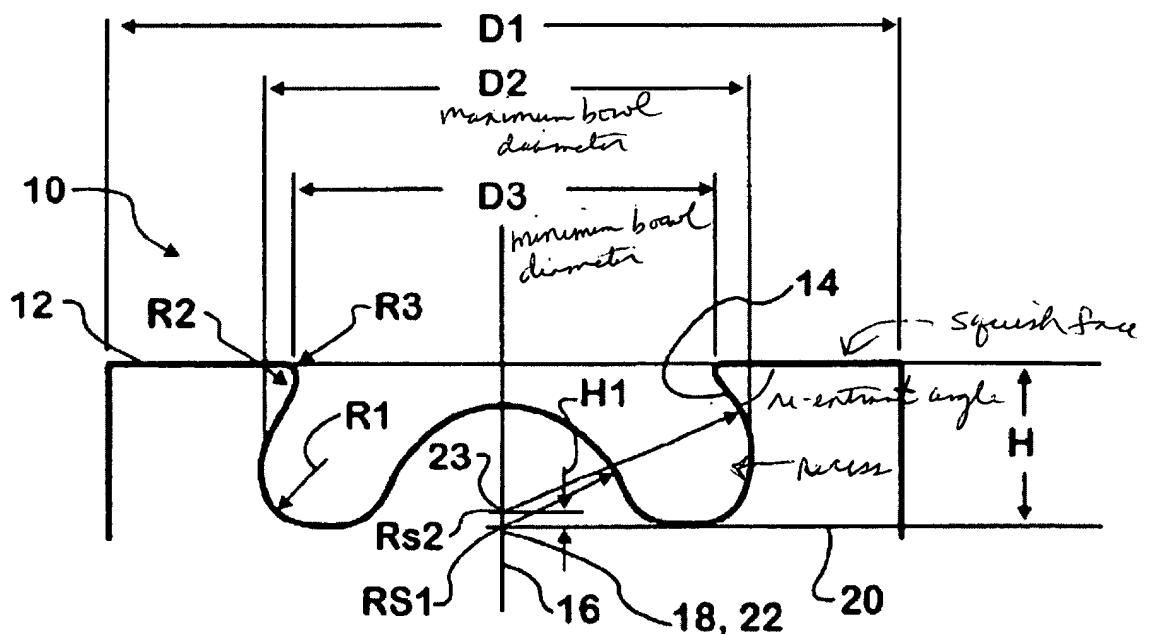
**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

Claims 1-4 and 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (6,513,476). Liu et al show everything disclosing the reentrant angle, the diameter of the piston, the ranges for the maximum and minimum bowl radii, the upper and lower curve radii, and the bowl depth. Note a recess defined below the piston squish face and in relation to the bowl sidewall, and a substantially frustoconical inner surface bounded within said bowl sidewall and about the centerline. See the Figure below, and column 1, lines 55-59, which state that the chamber within the piston crown is symmetrical with respect to a combustion chamber central axis.



It would have been an obvious matter of design choice to employ a reentrant angle of about 50 degrees to about 70 degrees, since Liu appears to be within the same

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range, and it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

In addition, the specific ranges for the piston diameter, maximum and minimum bowl radii and upper and lower curve radii, and bowl depth, are matters of design choice, since such modifications would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). Note MPEP 2144.04(IV), which states:

A. Changes in Size/Proportion

*In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955) (Claims directed to a lumber package "of appreciable size and weight requiring handling by a lift truck" where held unpatentable over prior art lumber packages which could be lifted by hand because limitations relating to the size of the package were not sufficient to patentably distinguish over the prior art.); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976) ("mere scaling up of a prior art process capable of being scaled up, if such were the case would not establish patentability in a claim to an old process so scaled." 531 F.2d at 1053, 189 USPQ at 148.).

In *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

Claims 5-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (6,513,476) in view of Zhu et al (6,182,630) as applied to claims 1-4 above, and further in view of Paro (5,553,585). Liu et al in view of Zhu et al show everything except

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utilizing an anti-polish ring positioned at an upper portion of the liner wall, which projects into the cylinder while the piston is recessed substantially the same distance that the ring projects, the liner wall having an annular slot which receives the anti-polish ring. Paro teaches that it is old in the art to employ an anti-polish ring positioned at an upper portion of the liner wall, which projects into the cylinder while the piston is recessed substantially the same distance that the ring projects, the liner wall having an annular slot which receives the anti-polish ring. It would have been obvious to one of ordinary skill in the art to modify Liu et al in view of Zhu et al by employing the anti-polish ring of Paro, in order to remove carbon deposits from the piston. Furthermore, it would have been obvious to one of ordinary skill to form the ring integrally with the liner, as this is an art recognized equivalent to forming the ring separately and later joining it with the liner, known for the same purpose, as evidenced by applicant claiming both alternatives.

### ***Response to Arguments***

Applicant's arguments filed 11/28/05 have been fully considered but they are not persuasive.

Applicant argues that it is longstanding practice in the art of diesel engine engineering to provide diesel engines having piston diameters of more than 180 mm with an obtuse re-entrant angle of the crown bowl side. The examiner notes that it is common to provide all engines, both diesel and gasoline, of any diameter piston with an obtuse re-entrant angle of the crown bowl side. This is a conventional piston feature. Thus, the relevance of this argument is unclear.

Applicant further argues that small and medium bore high engine speed engines are subjected to lower mechanical and thermal loads when compared to large bore medium speed diesel engines. The point is well taken, but the relevance is unclear.

Applicant, in the course of this statement, incorrectly assumes that Liu (6,513,476) is directed to a small or medium bore high engine speed engine. Liu is not limited to small or medium bore engines, since the Liu reference does not specify the piston diameter or anywhere indicate a size preference for the piston. (Liu is also silent as to the speeds utilized.)

Applicant further states that the acute re-entrant design allows for air swirl motion and fuel spray jet impingement to help cool the piston and minimize the higher thermal stresses on the rim. This appears to be true, but the relevance to patentability is unclear.

Applicant further states that acute re-entrant designs *as described in Liu* are not generally scalable to pistons for large-bore, medium speed diesel engines. Applicant's attention is drawn to the fact that nowhere in Liu is there any limitation as to the size of the piston or the speed of the engine. Thus, this statement is based on an incorrect assumption.

To support this statement, Applicant maintains that for large bore medium speed diesel engines, there is generally no air swirl, and fuel spray jets do not impinge on the bowl. The examiner does not believe this to be true, and does not find that it supports any relevant argument for patentability. Applicant then goes on to say that "Instead, for large-bore, medium speed diesel engine pistons, a recess is generally defined below

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the piston squish face and in relation to the bowl sidewall in order to cool the piston.” Indeed, Applicant appears to be saying that the recess being generally defined below the piston squish face and in relation to the bowl sidewall, which is in the newly amended claims, is a known feature of prior art large bore engines.

Applicant then continues saying that small and medium bore, high speed engines do not have these recesses, and are therefore not scalable for large bore, medium speed diesel engines, and that the prior art somehow teaches away from the instant invention. If, as Applicant maintains, small and medium bore, high-speed engines do not have these recesses, and we can see from the Figure shown above that Liu does have this recess, then Liu must not be a small or medium bore, high speed engine, but must be a large bore, medium speed diesel engine.

The examiner realizes that this is not what Applicant intended to say, but in fact Applicant's arguments are so confusing that they appear to try to prove that something is true simply by repeating it many times.

Applicant then points out that claims 1 and 3 have been amended to include a recess defined below the piston squish face, which is simply another way of saying what the claims already say and is clearly shown in the Liu reference.

Applicant also argues that the bowl inner wall of Liu is not substantially frustoconical because the walls of the bowl are curved. This is not convincing because the walls of the bowl of the instant invention are also curved, and both bowls show portions, which appear to be substantially straight, and as noted by Liu, “It is noted that the transition between RS1 and R1 is smooth and tangential...”

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In sum, Applicant's argument that the piston of Liu is not readable on the claims is not convincing. The piston of Liu is not limited as to size. It may be employed in a diesel engine of any size, and Applicant has not provided any convincing argument which shows that 1) Liu is only applicable to small and medium size pistons; and 2) Even if Liu did state, hypothetically, that it was intended for a small engine application, there would be no reason why it could not be scaled up for a large engine application, since the problem Liu is solving, namely reducing soot entrainment and  $\text{No}_x$  emissions while at the same time slightly increasing engine power output are relevant problems for large engines, as well as small engines.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marguerite J. McMahon whose telephone number is 703-308-1956. The examiner can normally be reached on flex.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yuen Henry can be reached on 703-308-1946. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**MARGUERITE MCMAHON**  
**PRIMARY EXAMINER**